

The long road to protecting critical habitat for species at risk: The case of southern mountain woodland caribou

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Abstract

Identifying habitat that is essential to the recovery of species at risk, known as critical habitat, is a major focus of species at risk legislation, yet there has been little research on the degree to which these areas are protected. Here, we first review the provisions for protecting critical habitat on non-federal lands within Canada's Species at Risk Act (SARA). Next, we use the declining southern mountain population of woodland caribou (*Rangifer tarandus caribou*) in British Columbia, Canada as a case study to show that identification of critical habitat does not guarantee its protection on non-federal lands. Our analyses show that 909 km² of critical habitat identified on provincial lands were logged in 5 years after it was legally identified under SARA. Existing provincial legislation and policies have provided incomplete protection of caribou critical habitat, and Canada's federal government has yet to exercise authority under SARA that could protect these areas. In the absence of nondiscretionary protection under provincial legislation, a combination of alternative mechanisms, involving all levels of government, Indigenous people, and industry, will be essential to protect critical habitat and help recover species at risk.

KEYWORDS

caribou, critical habitat, habitat protection, indigenous people, species at risk

1 | INTRODUCTION

Habitat loss and degradation are the biggest threats to species at risk worldwide (Baillie, Hilton-Taylor, & Stuart, 2004; IPBES, 2018). Identifying and protecting *critical habitat*, defined generally as the habitat required for the recovery of a listed species or population (Hall, Krausman, & Morrison, 1997), are major focuses of species at risk (SAR) legislation around the world. Critical habitat identification

is required for all species listed under the U.S.' Endangered Species Act (ESA) and for species listed as threatened, endangered, or extirpated under Canada's Species at Risk Act (SARA), although it is optional in other jurisdictions, such as Australia under the Environment Protection and Biodiversity Conservation Act (EPBCA; Martin, Camaclang, Possingham, Maguire, & Chadès, 2016). SAR legislation typically protects critical habitat by prohibiting activities that adversely modify, damage, or destroy those areas. However,

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protection of SAR and their critical habitat is often at odds with social, economic, and political interests (Mooers et al., 2010) and may require multiple complementary approaches to succeed.

Despite the legal imperative to identify critical habitat for SAR, only 44% of species listed under the ESA, <12% of species listed as threatened, endangered or extirpated under SARA and <1% of species listed under the EPBCA had fully identified critical habitat as of 2015 (Bird & Hodges, 2017; Martin et al., 2016). Many issues plague critical habitat identification, including bias across taxon, habitat type and lead agency (Favaro et al., 2014; Schwartz, 2008; Taylor & Pinkus, 2013), a lack of legal timelines (Mooers et al., 2010), delays in recovery planning (Ferreira et al., 2019), insufficient scientific information, expertise, and funding (Bird & Hodges, 2017; Camaclang, Maron, Martin, & Possingham, 2015; Martin et al., 2016), and judicial and political intervention (Hagen & Hodges, 2006).

For species whose ranges overlap with economically valuable natural resources, identification and subsequent protection of critical habitat are often contentious (Fortin, Mcloughlin, & Hebblewhite, 2020). Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) in Alberta (Committee on the Status of Endangered Wildlife in Canada, 2016), southern resident killer whales (*Orcinus orca*) in British Columbia (BC; Government of Canada, 2018c) and northern spotted owls (*Strix occidentalis caurina*) in Oregon and Washington (Proctor & Pincetl, 1996) are examples of species whose critical habitat identification or protection was complicated in part because their ranges overlap economically valuable natural resources. Even if critical habitat is identified for a species, the degree to which these areas are protected is unclear.

In BC, the threatened Woodland Caribou, Southern Mountain Population (*Rangifer tarandus caribou*; as officially listed under Canada's federal SARA; hereafter, "southern mountain caribou"), inhabits contiguous tracts of old growth, temperate rainforest that also help support a multi-billion dollar forestry industry. In the 2014 Recovery Strategy for southern mountain caribou, Environment and Climate Change Canada (ECCC) identified and mapped critical habitat for the species on non-federal lands, almost all of which is on BC provincial lands (ECCC, 2014b). Similar to Australia's EPBCA but unlike the ESA, Canada's federal SARA does not automatically provide protection for critical habitat on non-federal lands (Bird & Hodges, 2017; Shumway, Lunney, Seabrook, & McAlpine, 2015). While the federal government has discretionary power to broaden the application of SARA onto provincial lands identified as critical habitat for southern mountain caribou, we review below why it has yet to do so. BC currently has no SAR legislation to provide legal protection for southern mountain caribou critical habitat on

provincial land, so the province must rely on other laws to protect these areas. To our knowledge, there has been little research focusing on the degree to which critical habitat on non-federal lands has been protected after its identification for any SARA-listed species in Canada. Our analyses estimate that 909 km² of southern mountain caribou critical habitat on BC provincial land were logged in 5 years after its identification through June 2019. Thus, for southern mountain caribou critical habitat on non-federal lands, identification has not yet equaled protection.

Here, we provide a broad overview of Canadian federal and BC provincial legislation that offers varying degrees of protection of critical habitat. We describe provincial and federal legal authority over SAR and outline provisions under Canada's federal SARA that can be implemented to protect identified critical habitat. We then use southern mountain caribou in BC as a case study to highlight the institutional and practical challenges of protecting critical habitat in Canada via SAR legislation. We provide a brief background on southern mountain caribou population declines, describe what constitutes destruction of southern mountain caribou critical habitat as defined in the federal Recovery Strategy, outline specific existing tools for caribou critical habitat protection under SARA and BC provincial legislation, and discuss alternative mechanisms to protect their critical habitat. We determine the degree to which southern mountain caribou critical habitat has been protected by overlaying critical habitat data with publicly available data on timber harvest to estimate the area harvested in critical habitat in 5 years following its identification in the Recovery Strategy in June 2014. Finally, we discuss how using existing legislative and policy tools, in combination with recognizing and affirming Indigenous rights, can help protect caribou critical habitat and recover imperiled species.

2 | CANADA SAR LEGISLATION OVERVIEW

2.1 | Provincial control over natural resources and wildlife

Lawmaking power over SAR is shared jurisdiction in Canada. The Constitution Act, 1867 did not explicitly allocate power on environmental protection among the federal and provincial governments. Instead, Canadian courts have allocated federal authority to make environmental laws based on listed federal powers to legislate over federal lands, inland fisheries, criminal law, matters of national concern, as well as enter into international treaties (Scott, 2017). In relation to SAR, the federal government has clear authority to make laws protecting wildlife on federal lands, aquatic species, and migratory

birds. However, the power to make laws governing SAR and their terrestrial habitats lies primarily with the provincial governments because the Constitution Act, 1867 gave provinces lawmaking power over provincial property (Olive, 2014).

Canada is unique among jurisdictions with SAR legislation in that nearly 90% of its land base is public land, known as Crown land, over half of which is provincially owned (Government of BC, 2011). In BC, 94% of the land is provincial Crown land, 5% is privately owned, and the remaining 1% is federally owned (Government of BC, 2011). Because wildlife and habitat on provincial Crown land are considered provincial property and are therefore the legislative jurisdiction of the provinces rather than the federal government, the application of protection measures in SARA with respect to identified critical habitat in BC is constrained. Meaningful conservation of SAR in Canada will usually require provincial law and policy, or at the very least, provincial cooperation with federal SARA recovery plans.

2.2 | Critical habitat identification and protection via SARA on non-federal lands

SARA requires the federal government to identify all critical habitat for threatened and endangered species in a recovery strategy, which also identifies threats to species survival and objectives for population recovery. Recovery strategies must include examples of specific activities that are likely to destroy critical habitat, such as, for example, mining exploration and logging. Sections 47 and 49 of SARA require ECCC to prepare action plans for listed species that, among other things, set out how the recovery and critical habitat protection objectives from recovery strategies will be achieved. SARA does not legislate a timeframe for the development of action plans but requires that recovery strategies indicate when action plans will be completed. Missing action plans are a systemic issue under SARA: as of January 2020, there were 304 completed recovery strategies and only 74 completed action plans on the SARA public registry (Government of Canada, 2020b).

2.2.1 | SARA section 61 and section 80 orders

There are two key provisions in SARA that provide for legal protection of terrestrial critical habitat located on non-federal lands. First, section 61 provides that for a specified portion of critical habitat, the federal government may issue an order on the recommendation of the responsible

Minister that applies the critical habitat protections of SARA on provincial lands. The Minister must make this recommendation under section 61 if they form the opinion that an endangered or threatened species is not effectively protected through existing federal or provincial legislation (including any SARA section 11 conservation agreements—see “SARA section 11 conservation agreements”). Second, section 80 provides that the federal government may, on the recommendation of the responsible Minister, issue an emergency protection order that identifies *any* habitat that is necessary for the protection of a listed species and to prohibit activities that may adversely affect the species or its habitat. The Minister must make this recommendation under section 80 if they form the opinion that the species is experiencing an imminent threat to its survival or recovery.

One difficulty with protecting critical habitat on non-federal lands under SARA is that the federal government has considerable discretion with respect to forming opinions and issuing orders under sections 61 and 80 so that social and economic effects are considered in the decision. Further, the Canadian federal government has historically been reluctant to exercise environmental authority over matters on provincial lands (Fluker & Stacey, 2012). Not surprisingly then, the federal government has yet to exercise its power under section 61 of SARA and has only issued two section 80 emergency protection orders since SARA was enacted in 2003; one for the western chorus frog (*Pseudacris triseriata*) in Quebec and one for greater sage-grouse (*Centrocercus urophasianus*) in southern Alberta and Saskatchewan. For the western chorus frog, the order prohibited critical habitat destruction from a housing subdivision development project near Montreal in a small spatial extent (2 km²; Government of Canada, 2016). For sage grouse, the order prohibited certain activities (e.g., operation and development of oil wells) across 1,672 km², costing an estimated CAD \$10 million over 5 years in foregone gross revenues from oil production (Government of Canada, 2013).

2.2.2 | SARA section 11 conservation agreements

A third provision in SARA that provides for legal protection of terrestrial critical habitat on non-federal lands is section 11. This provision represents a collaborative approach in that it does not require the federal government to legislate over provincial jurisdiction. Section 11 allows the federal government to enter a “conservation agreement” with any government, organization, or private landowner to benefit a listed species, including by protecting its critical habitat. Such an agreement promotes coordination between two or more parties and, if implemented, may obviate the need for a federal order

over non-federal lands issued under sections 61 or 80 of SARA. As of April 2020, all six section 11 conservation agreements for terrestrial species that are published on the SARA public registry relate to woodland caribou (Government of Canada, 2020b). Despite the potential of section 11 conservation agreements to protect critical habitat and aid species recovery, it is unclear whether these agreements will provide strict legal protection of critical habitat.

Section 11 conservation agreements are similar in some ways to Habitat Conservation Plans (HCPs) under the U.S. ESA, which protect listed species and their habitats on non-federal lands. HCPs balance species protection on private lands with property rights of landowners by allowing incidental “take” (e.g., killing, destroying habitat) of a listed species under an approved plan that includes habitat protection and minimizes take (Langpap & Kerkvliet, 2012). As of August 2019, 697 approved HCPs provide habitat protection on private lands for 271 species listed under the ESA (U.S. Fish and Wildlife Service, 2019). The U.S. Fish and Wildlife Service frequently signs HCPs with private companies involved in natural resources development and extraction.

2.3 | Critical habitat protection via BC provincial legislation

Although it is the most biodiverse Canadian province and has the most species at risk, BC is one of four provinces and two territories without SAR legislation and therefore must use other legislative tools to protect critical habitat identified on provincial land. The BC legislature has considered at least six SAR bills since 2010, yet none have advanced (Westwood et al., 2019). Instead, the province relies on a suite of existing provincial laws and policies, which so far has provided incomplete protection of critical habitat. We provide a detailed discussion of BC legislation and policy related to critical habitat protection in the following southern mountain caribou case study.

3 | SOUTHERN MOUNTAIN CARIBOU CASE STUDY

3.1 | Southern mountain caribou status

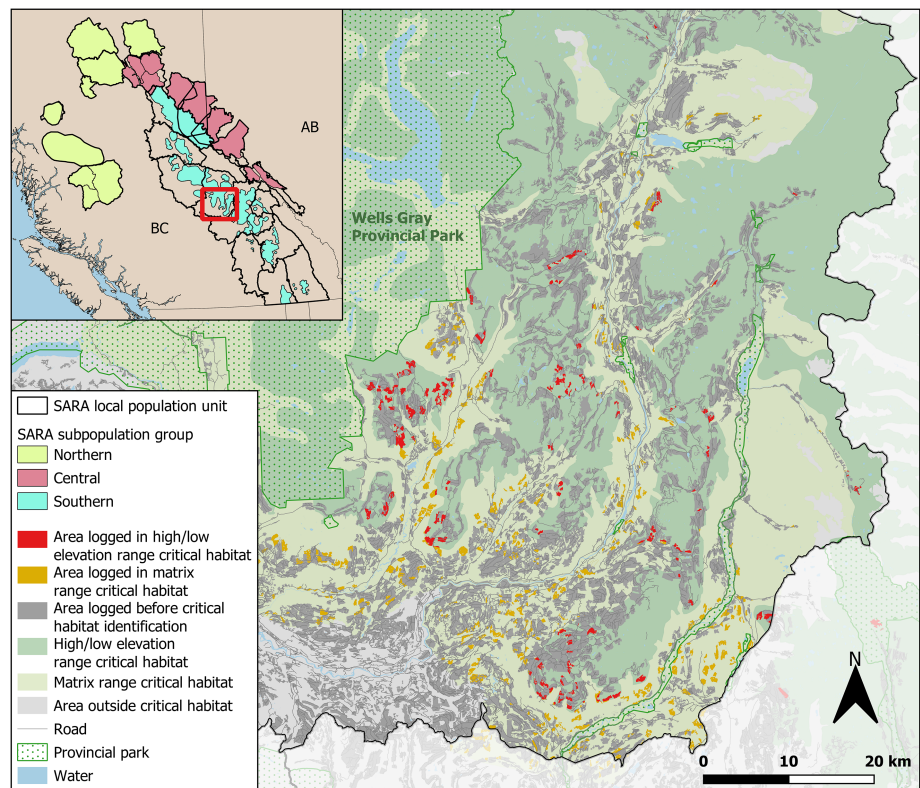
Woodland caribou are a subspecies of caribou that live in the boreal forests and mountains across Canada. They require large, contiguous tracts of mature forest and are considered a key ecological indicator and an umbrella species for boreal biodiversity (Bichet, Dupuch, Hébert, Le Borgne, & Fortin, 2016; Drever et al., 2019). Most woodland

caribou populations across Canada are declining, ultimately due to decades of habitat loss and fragmentation from industrial development, which alter predator–prey dynamics and lead to increased caribou mortality (Festa-Bianchet, Ray, Boutin, Côté, & Gunn, 2011; Wittmer, McLellan, Serrouya, & Apps, 2007). Activities such as logging and oil and gas extraction create productive early successional habitats that boost numbers of species such as moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*), both primary prey for wolves (*Canis lupus*; Seip, 1992; Serrouya, McLellan, Boutin, Seip, & Nielsen, 2011; Latham, Latham, McCutchen, & Boutin, 2011). Higher prey biomass supports higher wolf densities, increasing the probability of wolves encountering and killing caribou, and driving their populations toward extinction (DeCesare, Hebblewhite, Robinson, & Musiani, 2010).

Southern mountain caribou, an ecotype of woodland caribou, range from north-central BC to southeast BC (they were extirpated from the United States in 2019), including mountainous portions of western Alberta (Figure 1). They inhabit a range of biogeoclimatic zones that include low-elevation forests, subalpine parklands, and rugged alpine tundra (Hummel & Ray, 2008). The process for listing and recovering southern mountain caribou under SARA began two decades ago. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), a non-governmental body that assesses species at risk and recommends listing status under SARA, originally designated southern mountain caribou as threatened in 2000. Southern mountain caribou were listed as threatened under SARA in 2003. Although COSEWIC split the ecotype into three new designatable units in 2011 and upgraded their status to endangered in 2014, southern mountain caribou under SARA retain the population structure and threatened status from their 2003 listing. The Recovery Strategy, which included incomplete mapping of southern mountain caribou critical habitat, was posted to the SARA public registry in June 2014, 7 years after its statutory due date under sections 42 and 43 of SARA. As required by SARA, the Recovery Strategy provided an action plan completion date, which was December 2017. No action plan exists as of May 2020.

The Recovery Strategy categorized southern mountain caribou by eco-evolutionary characteristics into the Northern, Central, and Southern Groups. Under SARA, they are further organized into local population units (LPUs), based on historical populations that have since declined and fragmented into recognized subpopulations (Ray, Cichowski, Johnson, Petersen, & Thompson, 2015). Since their listing under SARA in 2003, four subpopulations of southern mountain caribou have been extirpated and three more LPUs are likely functionally extirpated. ECCC estimated the total population of southern mountain caribou to be 3,746 animals in 2018, with 18 of

FIGURE 1 Map of logged areas and critical habitat types within the southern Wells Gray-Thompson local population unit of southern mountain caribou (*Rangifer tarandus caribou*), including portions of the Wells Gray and Groundhog subpopulations. Areas highlighted in red and orange were logged after critical habitat was identified in June 2014



23 (78%) LPUs exhibiting declines and 22 of 34 (65%) subpopulations numbering <100 animals (Government of Canada, 2018a).

3.2 | Southern mountain caribou recovery measures

Recovery of southern mountain caribou depends on both long-term critical habitat protection and restoration of disturbed habitats, along with short-term measures such as predator reduction (Serrouya et al., 2019). Southern mountain caribou have low reproductive potential and occupy relatively large areas at low densities to minimize their risk of predation and maximize survival and reproduction (ECCC, 2008). Accordingly, they require large areas of critical habitat to recover. Critical habitat identified in the Recovery Strategy constitutes 34.8% and 40.5% of the total area within southern mountain caribou LPU and subpopulation boundaries, respectively, in BC. Failure to protect identified critical habitat from degradation can undermine recovery efforts because it takes decades to restore degraded habitats to late successional stages preferred by southern mountain caribou (Apps et al., 2013; Wittmer et al., 2007). The BC provincial government has attempted to address the proximate cause of population declines (increased predation on caribou) through predator reductions and maternity penning to boost calf survival (Serrouya et al., 2019).

However, these emergency approaches do not address the ultimate cause of caribou declines and should only be used as tools to complement long-term efforts that protect and restore habitat.

3.3 | Southern mountain caribou critical habitat protection via SARA on non-federal lands

Specific activities that are likely to destroy critical habitat for southern mountain caribou, as defined in the federal Recovery Strategy, depend on the category of critical habitat identified, of which there are seven. The Recovery Strategy established thresholds for each of these critical habitat categories indicating the minimum amount of undisturbed habitat necessary to achieve recovery within the LPUs (ECCC, 2012; see Table S1 for details on different types of critical habitat). For most critical habitat categories, including high and low elevation summer and winter ranges, the Recovery Strategy identified any activities that result in the “direct loss,” “degradation,” or “cumulative loss” of critical habitat as activities that are likely to destroy it (e.g., logging, road construction). Areas in these categories were mapped as “high/low elevation range” critical habitat based on an elevation threshold that was putatively related to caribou life-history. The Recovery Strategy defined seasonal migration areas, areas with low caribou densities, and dispersal zones,

as “matrix range” critical habitat. If not “sufficiently mitigated,” logging and road construction are acknowledged to likely destroy certain types of matrix range critical habitat by increasing the likelihood of higher predator densities (by creating favorable conditions for more deer and/or moose) or by reducing the effectiveness of predator management. In other words, to avoid critical habitat destruction, logging and road construction must not increase predator densities and must maintain the effectiveness of predator management. However, it is unlikely that any mitigation measures for timber harvesting achieve both goals, nor does the Recovery Strategy offer guidance on this point.

We overlaid spatial polygons for high/low elevation range and matrix range southern mountain caribou critical habitat (ECCC, 2014a) with BC government data on logging clear cuts (British Columbia Data Catalogue, 2019a) to estimate the area logged within critical habitat after its identification. We calculated that 314 km² of high/low elevation range critical habitat and 595 km² of matrix range critical habitat in BC were logged in 5 years following critical habitat identification in June 2014 (see Figure 1, e.g., of critical habitat destruction and Supporting Information S1 for details on spatial analyses). These areas reflect increases of 49% and 57%, respectively, in the area logged within high/low elevation and matrix ranges compared to the 5 years before critical habitat identification (Figure 2). The increase in critical habitat area logged from 2009 to 2018 mirrored observed increases in manufactured forest product sales and forest exports throughout the BC forestry industry during the same period following the 2008–2009 economic recession (Fortin et al., 2020; Ministry of Forests, Lands

Operations, 2019). These numbers show that critical habitat identification has not prevented timber harvest within critical habitat. Moreover, these results do not include indirect critical habitat loss, through avoidance and increased predation, in areas immediately adjacent to logged areas. The Recovery Strategy, borrowing from the boreal caribou recovery strategy, defines any habitat within a 500-m buffer of human development as disturbed (ECCC, 2012). Such areas no longer constitute critical habitat for critical habitat categories that are managed for minimal disturbance (see Table S1). Applying the 500-m buffer to logged areas within these critical habitat types increases the total area of newly disturbed critical habitat in 5 years following its identification by 1,422 km² (to 1,736 km²) in high/low elevation range and by 2,956 km² (to 3,551 km²) in matrix range.

3.3.1 | SARA section 61 and section 80 orders for southern mountain caribou

Neither of the two emergency orders issued under section 80 to date (for the western chorus frog and sage grouse) carried the potential for negative social and economic consequences that may result from a similar order for southern mountain caribou, which inhabit large tracts of old-growth forests that help support the BC forestry industry, which contributed CAD \$7 billion to provincial GDP in 2018 (Statistics Canada, 2019). In comparison, a proposed moratorium on timber harvest for 2,245 km² in portions of six southern mountain caribou LPUs could decrease provincial GDP by an estimated CAD \$94 million annually (Stantec Consulting Ltd., 2019). While section 64 of SARA contemplates the possibility that parties may be compensated for losses in cases of “extraordinary impact” resulting from critical habitat protection, we are not aware of any such compensation being paid to date. The prospect of job losses and fewer recreation opportunities has sparked local opposition to southern mountain caribou habitat protection achieved through moratoria on timber harvest and recreation. A 2013 study found that local interest groups in Revelstoke, BC each cited different causes for local caribou population declines and assigned blame to other groups, highlighting the polarization and political challenges surrounding the issue of caribou conservation (Bixler, 2013).

The likelihood of a SARA section 80 emergency order to protect southern mountain caribou critical habitat will ultimately depend on a political calculation. On one hand, the willingness of the courts to scrutinize ministerial discretion exercised under section 80 of SARA, together with the opinion from the Minister's 2018 assessment that southern mountain caribou are experiencing imminent threats to their recovery (Government of

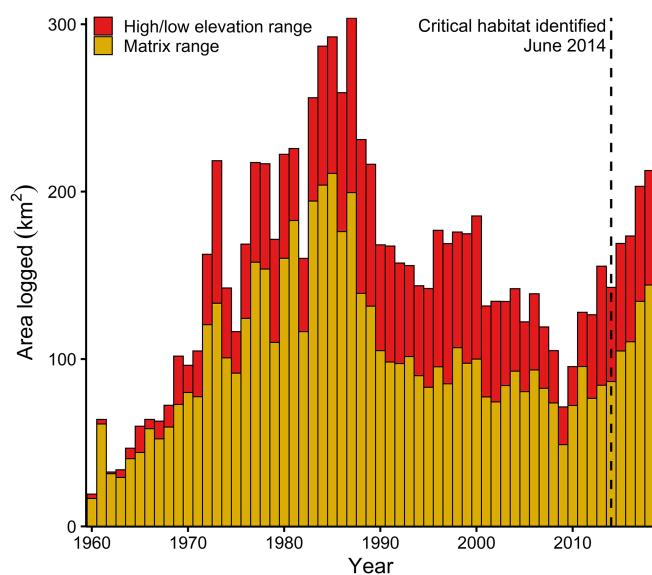


FIGURE 2 Area logged by year within current southern mountain caribou (*Rangifer tarandus caribou*) critical habitat boundaries in British Columbia

Canada, 2018a), lends support to the view that the Minister may recommend that the federal government issue an emergency order to protect critical habitat for the southern mountain caribou on provincial lands. Recent judicial decisions interpreting section 80 of SARA have scrutinized ministerial reluctance to recommend issuing emergency protection orders for boreal woodland caribou in Alberta and western chorus frog in Quebec (Adam v. Canada, 2011; Centre québécois du droit de l'environnement v. Canada, 2015). In both cases, the court ordered the Minister to reconsider their refusal to recommend that the federal government issue an emergency order. The Minister responded by declining to recommend issuing an emergency order in the boreal woodland caribou case but recommended issuing the order in the western chorus frog case (Government of Canada, 2016). For southern mountain caribou, the federal government has indicated its preference to negotiate a solution for critical habitat protection with BC provincial and Indigenous governments using section 11 conservation agreements rather than by using its discretionary power to issue a section 80 order that would override provincial authority (Stueck, 2019). Federal overreach, along with potentially negative effects on recreation and forestry, may be politically unpalatable, and the federal government appears reluctant to exercise its discretionary power to protect southern mountain caribou critical habitat on BC provincial lands.

3.3.2 | SARA section 11 conservation agreements for southern mountain caribou

The federal government and the Province of BC finalized a bilateral section 11 conservation agreement (hereafter, "Bilateral Agreement") for southern mountain caribou in February 2020. The Bilateral Agreement establishes a framework for intergovernmental cooperation and outlines several measures and strategies intended to recover all three groups of southern mountain caribou. The agreement does not explicitly propose prohibiting any activities, such as timber harvest, that have the potential to destroy critical habitat (Government of Canada, 2020a). The parties to the agreement for southern mountain caribou in BC to date do not include timber companies, which hold long-term licenses (usually 20–25 years) to harvest timber on provincial Crown land. It is unclear how this agreement will affect timber harvest for companies with licenses that cover thousands of square kilometers within identified critical habitat and that provide exclusive rights to forest management and harvest for decades.

In addition to the Bilateral Agreement, the federal and provincial governments finalized a Partnership

Agreement under SARA section 11 with the West Moberly and Sauteau First Nations in February 2020 that complements the Bilateral Agreement by providing additional protections for the Central Group of southern mountain caribou. The Partnership Agreement goes further than the Bilateral Agreement by establishing moratoria on industrial disturbance in specific areas and providing concrete details on measures to protect and restore habitat (Government of Canada, Government of BC, Sauteau First Nations, & West Moberly First Nations, 2020). Specifically, the Partnership Agreement formalized a set of BC Government interim moratoria from June 2019 on new logging and road construction permits within a 7,551-km² area of provincial Crown land. These moratoria overlap portions of seven subpopulations, four LPUs and 5,217 km² (10%) of existing high/low elevation critical habitat (7% of all southern mountain caribou critical habitat). All parties agreed to review and reassess the moratoria every 2 years over the duration of the 30-year agreement. The Partnership Agreement provides an example of how engaging Indigenous governments can strengthen critical habitat protection through SARA. However, the creation of similar agreements involving Indigenous governments in BC is not without significant challenges, including uncertainty over territorial sovereignty. Large portions of BC's provincial Crown land are on unceded traditional territory claimed by First Nations, who retain Aboriginal title to these lands and their resources along with the provincial government (Rossiter & Wood, 2016).

3.4 | Southern mountain caribou critical habitat protection via BC provincial legislation and policy

Because BC does not have dedicated SAR legislation, the province relies on other mechanisms to protect critical habitat for southern mountain caribou. A 2017 study conducted by the federal and BC governments listed 15 "legislative instruments" that could prohibit destruction of caribou critical habitat, five of which focus on restriction or prohibition of timber harvest and road construction (Figure 3; Government of Canada, 2017). Below, we briefly highlight three instruments administered under the Forest and Range Practices Act (FRPA) and the Oil and Gas Activities Act (OGAA), as well as a policy approach through the Cumulative Effects Framework.

Both FRPA and OGAA include regulations that implement management and protection for environmental values in BC, yet the spatial distribution and degree of protection for southern mountain caribou critical habitat offered by FRPA and OGAA is highly variable and

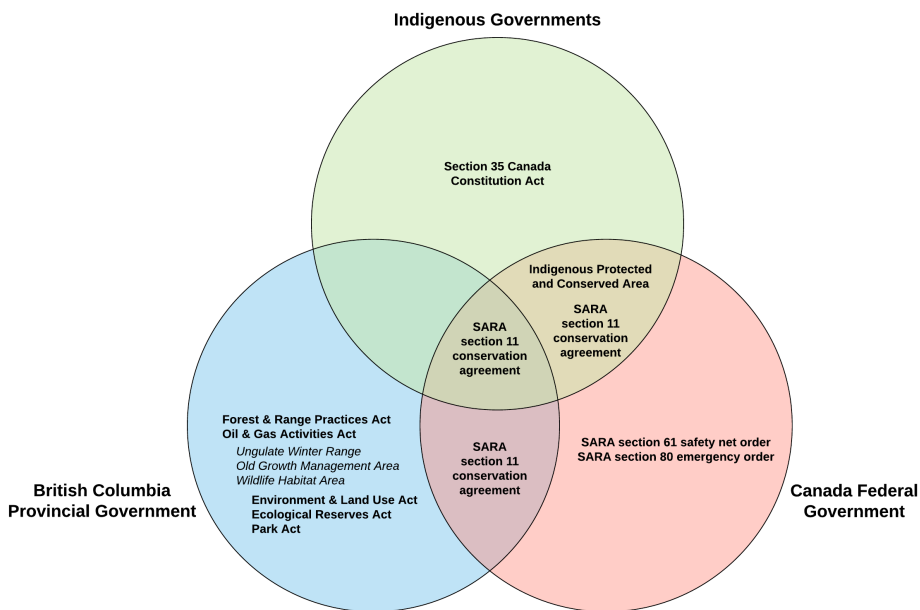


FIGURE 3 Legislative tools and agreements that can potentially protect southern mountain caribou (*Rangifer tarandus caribou*) critical habitat in British Columbia by restricting and prohibiting timber harvest and road construction

depends on the critical habitat category. Regulations under FRPA and OGAA allow the BC Minister of Environment and Climate Change to establish Ungulate Winter Ranges (UWRs) and Wildlife Habitat Areas (WHAs). UWRs and WHAs established to protect southern mountain caribou either prohibit forest harvesting activities in high elevation winter areas (“no harvest zones”) or allow for harvest with some restrictions in low elevation winter areas and corridor areas (“conditional harvest zones”). FRPA and OGAA also allow the Minister to establish Old Growth Management Areas (OGMAs), which prohibit tree cutting except for cases of insect infestation and disease. Together, OGMAs and no harvest zones within UWRs and WHAs administered through FRPA or both FRPA and OGAA overlap 51% of high/low elevation range critical habitat (BC Data Catalogue, 2019b,c,d). These legislative tools appear to have been successful in protecting high/low elevation range critical habitat, as <7 km² of areas covered by their protections were logged in 5 years after June 2014. BC provincial parks, protected areas, and ecological reserves increase the total area receiving full protection to 47% of all southern mountain caribou critical habitat and 63% of high/low elevation range critical habitat. However, conditional harvest zones within UWRs and WHAs administered through FRPA or both FRPA and OGAA do not offer effective protection of critical habitat, as 80% of logged high/low elevation range critical habitat in 5 years following its identification overlaps these areas.

Unlike high/low elevation range critical habitat, matrix range critical habitat overlaps very few areas with existing provincial legislation that could provide protection. Less than 19% of matrix range critical habitat is protected by a combination of parks (14%) and OGMAs (4%), and none

overlaps UWRs or WHAs. Nearly 100% of matrix range critical habitat logged in 5 years after its identification is not protected by provincial legislation (Figure 4). The lack of legislation protecting matrix range critical habitat may reflect a reluctance of the BC provincial government to limit timber harvest in these areas. Notably, 50% of matrix range critical habitat and 47% of logged matrix range critical habitat overlaps the low elevation interior cedar-hemlock biogeoclimatic zone, which is among the most productive and economically valuable forest types for BC’s forestry industry (Meidinger & Pojar, 1991). In comparison, 9% of high/low elevation critical habitat and logged high/low elevation critical habitat overlaps the interior cedar hemlock zone. The discrepancy in protection between high/low elevation range and matrix range critical habitat for southern mountain caribou suggests that the discretionary measures in provincial law and policy can, but do not necessarily, amount to effective and enforceable critical habitat protection.

3.5 | Complementary and alternative mechanisms to protect critical habitat

Continued declines in southern mountain caribou numbers and ongoing destruction of their critical habitat underscore the need for alternative mechanisms to protect these areas and recovery the species. In addition to the legislation outlined above, BC is implementing a provincial Cumulative Effects Framework (CEF) that could influence the authorizations of future development projects that have the potential for adverse effects on identified critical habitat. The CEF is a policy instrument intended to complement existing provincial legislation, assessing and managing effects that accumulate

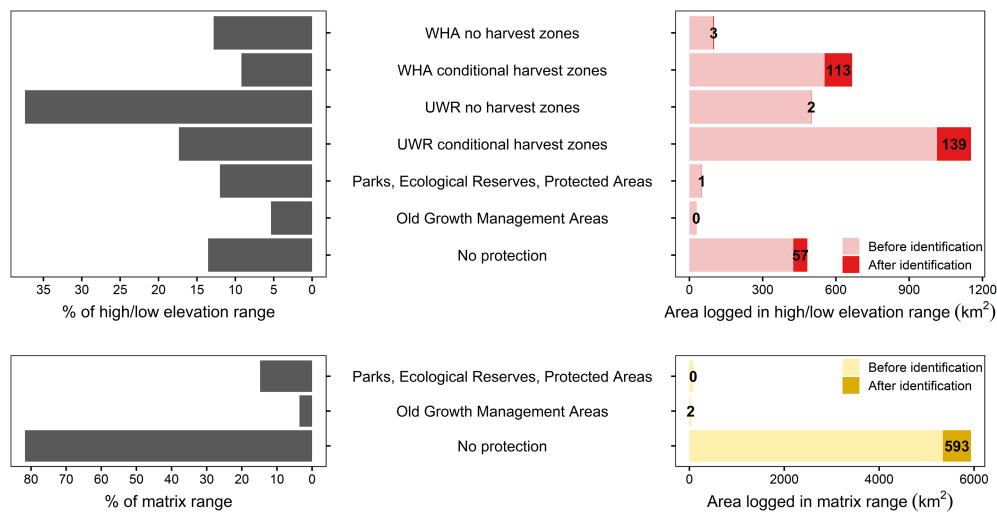


FIGURE 4 Percent of area in southern mountain caribou (*Rangifer tarandus caribou*) high/low elevation range (left, top) and matrix range (left, bottom) critical habitat covered by British Columbia provincial legislative tools that restrict timber harvest and road construction, and area logged before and after critical habitat identification in June 2014 within these same areas (right). Areas logged after critical habitat identification are labeled in bold. Some areas of critical habitat are covered by more than one legislative tool

from multiple sources across the landscape on different “values” such as old growth forests. The CEF stems in part from criticism of the province’s environmental assessment process, which fails to consider the interacting effects of multiple development projects over space and time, and for southern mountain caribou, rarely rejects projects based on their potential for negative effects (Collard, Dempsey, & Holmberg, 2020). A test assessment protocol under the CEF for old growth forests includes specific forest tracts based on the presence of identified critical habitat and Land Act reserves for southern mountain caribou (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2017). The CEF offers a unified framework for provincial decision-makers across different ministries to follow when considering whether to approve authorizations and renewals for permits and licenses (e.g., for road construction and forest harvest), environmental assessments for development projects, and potential effects of proposed activities on established or asserted Aboriginal or treaty rights (Government of BC, 2016; Vlasschaert, 2016). Once implemented, the CEF may provide an opportunity to engage Indigenous people and local stakeholders in developing assessments, providing an avenue for transparent, participatory decision making that builds trust and public support for mitigating cumulative effects on critical habitat.

3.6 | Indigenous protected and conserved areas

Under section 35 of Canada’s Constitution Act, the governments of Canada and BC each have a legal obligation

to consult with Indigenous people when they consider actions that may adversely affect Aboriginal or treaty rights (Newman, 2014). Further, the right to hunt in perpetuity, as if they had not entered into treaty, is a common treaty right for many Indigenous people in Canada (Laird, Ross, & McKenna, 1899). A 2011 decision by the BC Court of Appeals found that the BC Ministry of Energy and Mines’ decision to approve an environmental assessment for coal mining exploration in southern mountain caribou critical habitat failed to consult with the West Moberly First Nations and infringed on their treaty rights to hunt caribou (West Moberly First Nations v. BC, 2011).

Establishment of Indigenous Protected and Conserved Areas (IPCAs) in regions where Indigenous people seek to assert their treaty rights may prove to be an effective and complementary policy tool to protect critical habitat, recognize treaty rights and address reconciliation with Indigenous people. IPCAs incorporate Indigenous values and traditional ecological knowledge into planning, stewardship, and management processes, which are shared between federal and Indigenous governments. Although both western science approaches and traditional ecological knowledge can inform critical habitat identification (Polfus, Heinemeyer, & Hebblewhite, 2014), the latter has been overlooked in the identification of critical habitat for southern mountain caribou. The concept of IPCAs marks an important shift from the colonial model of protected areas (Zurba, Beazley, English, & Buchmann-Duck, 2019). It adopts a more holistic approach to conservation that explicitly includes Indigenous people and cultural practices and supports the implementation of the 2015 Truth and

Reconciliation Commission's Calls to Action and the United Nation's Declaration on the Rights of Indigenous Peoples (Indigenous Circle of Experts, 2018).

IPCAs are being increasingly used in Canada as a holistic tool that both affirms Indigenous rights and protects caribou by explicitly recognizing cultural practices while working to conserve critical habitat for caribou. For example, in late 2018, the Decho First Nations, the federal government and the Government of the Northwest Territories established the Edézhzhíe Indigenous Protected Area (14,218 km²) in the Northwest Territories, which protects critical habitat for boreal woodland caribou. Farther south, the Kaska Dena First Nation recently received federal funding to pursue a proposed 40,000 km² Kaska IPCA in northern BC that would overlap large portions of six herds of northern mountain woodland caribou, which are listed under SARA as a Species of Special Concern. While conservationists can provide political leverage and information to support establishing IPCAs, it is important to note that IPCAs may have different objectives than traditional protected areas, such as enabling Indigenous land management toward self-determination and facilitating economic development. Further, IPCAs cannot be relied upon as the only means of protecting southern mountain caribou critical habitat.

3.7 | International treaties and agreements

Protecting critical habitat of imperiled species is consistent with and supports Canada's international commitments to conserve biodiversity and recognize the unique rights of Indigenous peoples. Canada is attempting to work with Indigenous people to help fulfill its commitments to protect at least 17% of terrestrial and inland fresh water areas by 2020 through Aichi Target 11 of the Convention on Biodiversity and Target 1 of the 2020 Biodiversity Goals and Targets for Canada (Government of Canada, 2018b). Recent research showed that within Canada, Brazil and Australia, Indigenous-managed lands support more vertebrate species than traditional protected areas (Schuster, Germain, Bennett, Reo, & Arcese, 2019). IPCAs and agreements between Indigenous and Crown governments affirm Canada's commitment to the United Nations Declaration on the Rights of Indigenous Peoples, which articulates the rights of Indigenous peoples to exercise rights to their lands, territories and resources and the maintenance of their cultures. Caribou conservation and critical habitat protection also help Canada meet its long-term commitments under the 2015 Paris Agreement on climate change to reduce emissions and increase carbon storage, because late-successional forests store huge amounts of carbon in

live biomass and in soils (Yona, Cashore, & Schmitz, 2019). International treaties and agreements, over which the federal government has constitutional jurisdiction, may serve to increase political pressure on federal and provincial governments to protect southern mountain caribou habitat.

4 | CONCLUSION AND RECOMMENDATIONS

Even after the extirpation of several subpopulations since the 2014 Recovery Strategy, and despite existing tools to fully protect critical habitat, logging and road construction continue to destroy southern mountain caribou critical habitat in BC. There are many political reasons for the federal government's reluctance to use orders under sections 61 and 80 of SARA for protecting southern mountain caribou critical habitat, yet these actions would provide the strongest immediate habitat protection. Instead, the federal government has entered a section 11 conservation agreement, but it is unclear whether the Bilateral agreement will provide effective protection for critical habitat located outside the moratoria areas defined in the accompanying Partnership Agreement. Further, there appears to be no strategic framework guiding decisions on which southern mountain caribou subpopulations receive concrete habitat protections, such as moratoria on resource development, in any future agreements under section 11.

Dedicated BC SAR legislation implementing non-discretionary critical habitat protection could effectively prevent habitat destruction but has yet to receive strong consideration from the BC legislature. In the absence of these approaches, alternative and complementary approaches are necessary to protect southern mountain caribou critical habitat. These include using tools under existing BC provincial legislation, collaborating with Indigenous peoples to develop and implement conservation agreements and IPCAs to recover caribou, and facilitating assessments and public engagement under the provincial CEF. In an era where conservation is riddled with challenges including a lack of funding, irreversible consequences for failure, and opposition from billion-dollar industry groups (Boan, Malcolm, Vanier, Euler, & Moola, 2018), saving imperiled species requires solutions that make gains across multiple objectives, thereby increasing the potential political benefits of conservation.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to share.

AUTHOR CONTRIBUTIONS

Eric C. Palm and Mark Hebblewhite conceived the idea. Eric C. Palm designed and conducted the spatial analyses. Eric C. Palm led the writing of the manuscript with support from Shaun Fluker, Holly K. Nesbitt, Aerin L. Jacob, and Mark Hebblewhite. All authors approved the manuscript for submission.

DATA AVAILABILITY STATEMENT

All spatial data on critical habitat, timber harvest and legislative tools in BC are freely available for download from sources cited in the text.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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